# Castanhão Reservoir-Triggered Seismicity - a new EPISODE on EPOS EPISODES Platform

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The man-made changes to the environment can impact the seismic activity within the altered site. Seismicity occurring around Castanhão Reservoir, NE Brazil, is an example of anthropogenic seismic activity related to the dam constructed over Jaguaribe River. The reservoir-triggered seismicity (RTS) can occur under artificial lakes, just as in this case. In this work, the waveforms from LS network of 6 seismological station (Nov. 2010 - Dec. 2011) were analysed to create an accessible earthquake catalog and an EPISODE for EPOS EPISODES Platform. The LTA/STA filter was used for initial detection of seismic events which allowed for detection of events that were later localized using TRMLOC algorithm on EPISODES Platform. 69 templated were used for localizing other seismic events with the use of PyMPA template matching algorithm. This step helped with detection of 227 seismic events that were recorded on at least 3 seismological stations. Hypo71 algorithm was used for localization of the earthquakes, that were later re-localized with double difference method using HypoDD software and utilizing 3 different methods. All the catalogs were later used with KIWITool software in order to estimate magnitude of the recorded events.

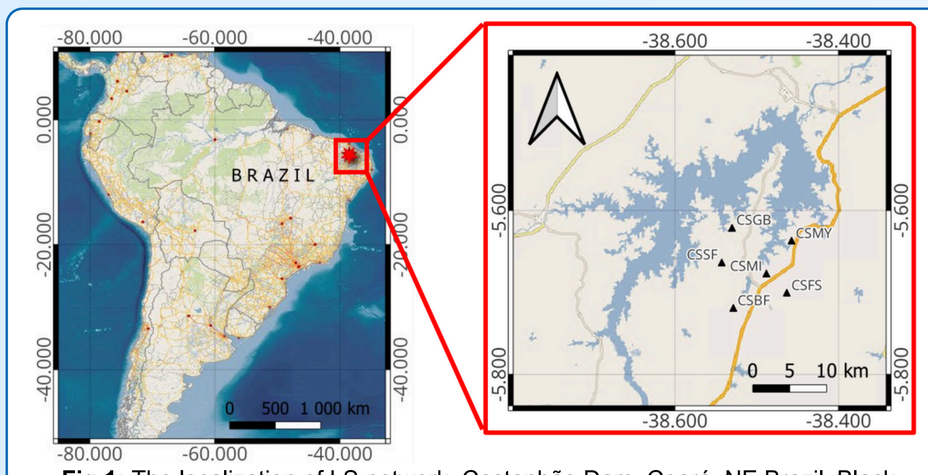


**Fig.1:** The localization of LS network, Castanhão Dam, Ceará, NE Brazil. Black triangles - seismological stations; blue triangle - the reservoir water gauging station.

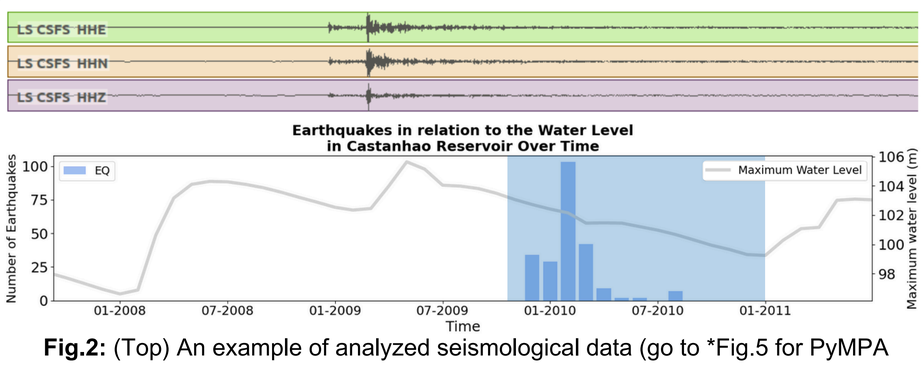


**Fig.2:** (Top) An example of analyzed seismological data (go to *Fig.5 for PyMPA template matching visualization); (Bottom) Seismic activity to water level. Blue-shaded area - data availability for LS network. Plot for Hypo71 localized events.

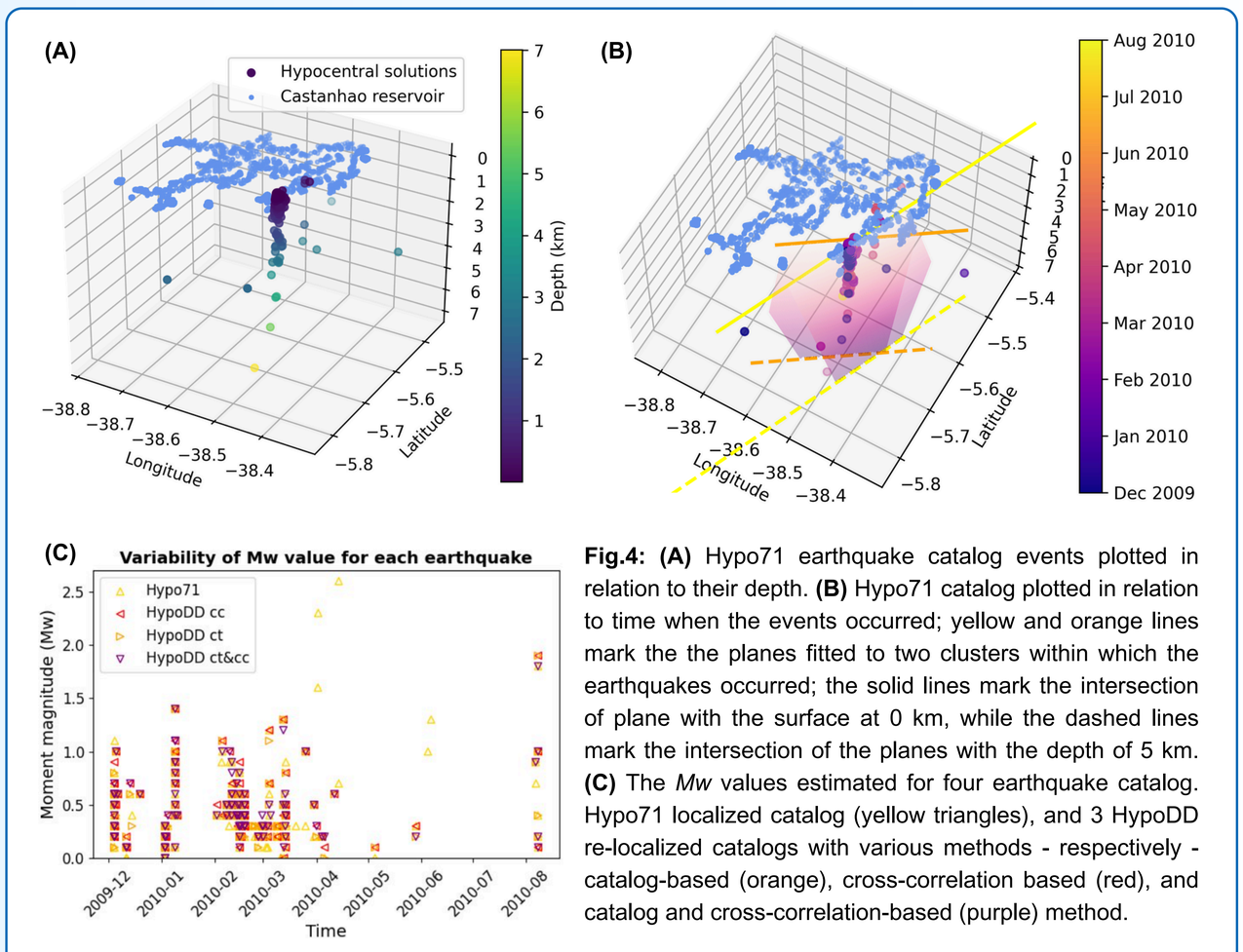


**Fig.4:** **(A)** Hypo71 earthquake catalog events plotted in relation to their depth. **(B)** Hypo71 catalog plotted in relation to time when the events occurred; yellow and orange lines mark the the planes fitted to two clusters within which the earthquakes occurred; the solid lines mark the intersection of plane with the surface at 0 km, while the dashed lines mark the intersection of the planes with the depth of 5 km. **(C)** The *Mw* values estimated for four earthquake catalog. Hypo71 localized catalog (yellow triangles), and 3 HypoDD re-localized catalogs with various methods - respectively - catalog-based (orange), cross-correlation based (red), and catalog and cross-correlation-based (purple) method.

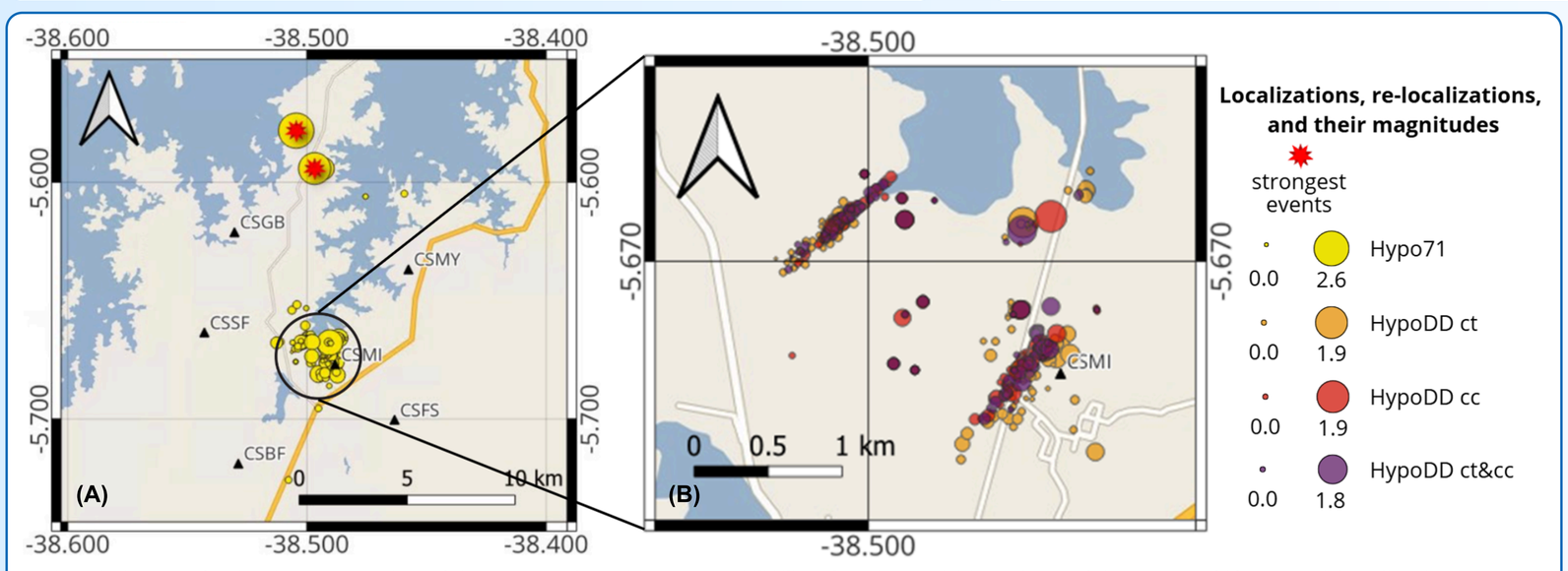


**Fig.3:** Maps of seismic events, size of the points plotted based on KIWITool-estimated *Mw* values of the events **(A)** Hypo71-localized original catalog, *Mw*=2.6 events marked with red stars; **(B)** Zoomed in on two clusters of re-localized seismic events events. Various colors represent the catalog re-localized with various HypoDD re-localization methods; ct - catalog-based, cc - cross-correlation-based, ct&cc - catalog and cross-correlation based method.

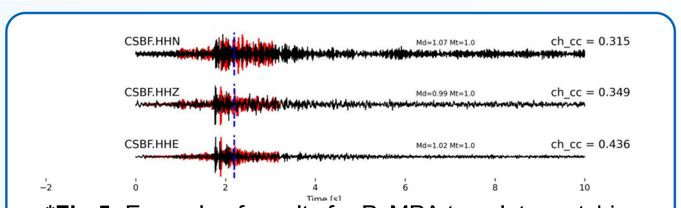


***Fig.5:** Example of results for PyMPA template matching algorithm for Castanhão Reservoir data. A template matched over a waveform with a cross-correlation value of the match

## SUMMARY

- PyMPA template matching used for earthquake detection (69 templates),
- localization with Hypo71 (227 events) and re-localization with HypoDD algorithms and three different methods resulted in catalogs with different number of re-localized events (ct-based - 145; cc-based - 143; ct&cc-based - 137),
- The *Mw* magnitude range varied depending on (re-)localization method (Hypo71: *Mw*: 0.0-2.6; HypoDD ct: *Mw*: 0.0-1.9; HypoDD cc: *Mw*: 0.0-1.9; HypoDD ct&cc: *Mw*: 0.0-1.8),
- Two clusters of seismicity were identified,
- Focal mechanisms need further investigation,
- All catalogs will be made available within new EPISODE on EPOS EPISODES Platform.

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